

REMARKS

Claims 1-35 are pending in the present application. In the above amendments, claims 1, 16, 18, 20, 24 and 35 have been amended and claims 21 and 30 have been cancelled. Therefore, after entry of the above amendments, claims 1-20, 22-29 and 31-35 will be pending in this application. Applicants believe that the present application is now in condition for allowance, which prompt and favorable action is respectfully requested.

Drawings

Originally filed figures 1-3 and 9 are objected to for being handwritten and unclear. Accordingly, corrected drawings in compliance with 37 C.F.R. § 1.121(d) are required in the application.

In response to the June 22, 2004 Notice to File Missing Parts of Nonprovisional Application, Applicants submitted replacement drawings in compliance with 37 C.F.R. § 1.84 and 37 C.F.R. § 1.121 on August 26, 2004. The Examiner's attention is respectfully directed to these previously submitted replacement drawings, which are believed to address the issues noted in the Office Action. Withdrawal of the objection to Figures 1-3 and 9 and removal of the formal drawing requirement are respectfully requested.

Claim Objections

Claims 20-23 and 24-27 are objected to because of informalities. Applicants have amended claims 20 and 24 and cancelled claim 21 to attend to the informalities noted in the Office Action. Withdrawal of the objection to these claims is respectfully requested.

Claim 30 is objected to under 37 C.F.R. § 1.75 as being a substantial duplicate of claim 29. Applicants have cancelled claim 30 in the application thereby rendering the objection moot.

Claim Rejections – 35 USC § 102

Claims 1-8, 10-23 and 28-34 are rejected under 35 USC § 102(e) as allegedly being anticipated by U.S. Patent Application Publication No. 2003/0076777 (“Stuber”). Applicants have reviewed the applied reference and respectfully submit that these claims are patentably distinguishable over Stuber for at least the following reasons.

Claim 1

Independent claim 1 concerns a method of transmitting signals using a plurality of transmit antennas. The method includes allocating the data to be transmitted among the plurality of transmit antennas, wherein at least one of the plurality of transmit antennas transmits some data that is not transmitted by all of the other of the plurality of transmit antennas. The method further includes transmitting a modified preamble from each of the plurality of transmit antennas, wherein the modified preamble has a conventional 802.11a preamble structure and is distinguishable at a receiver from a conventional 802.11a preamble.

As indicated above, claim 1 has been amended to specify that the modified preamble has a conventional 802.11a preamble structure. Support for this amendment is found throughout the specification, such as in paragraphs [0044] and [0050]. Stuber is not understood to disclose this feature of claim 1.

Stuber concerns an apparatus and method for providing efficient space-time structures for preambles, pilots and data in MIMO communication systems. As conceded in paragraph [0008], Stuber contends that the 802.11a preamble structure requires significant modifications to be useful in MIMO communications systems. As evidenced in figure 5, Stuber modifies the preamble structure to differ from that used in conventional 802.11a systems. Accordingly, Stuber is not understood to disclose at least the features of a modified preamble having a conventional 802.11a preamble structure.

Therefore, independent claim 1 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 1 are respectfully requested.

Claim 6

Independent claim 6 concerns a method of discriminating between a packet sent with a conventional 802.11a rate or with an extended rate. The method includes receiving one or more signals from one or more transmitters, the one or more signals including a long training subcarrier. The long training subcarrier is multiplied with a conventional 802.11a long training pattern to form a first product and multiplied with an extended 802.11a long training pattern to form a second product. From the first product and the second product, it is determined which long training pattern was more likely to have been sent for the received long training subcarrier. Finally, which type of packet was sent is discriminated based on the more likely sent long training subcarrier.

Stuber is not understood to disclose the foregoing features of claim 6. In particular, Stuber is not understood to disclose at least the features of multiplying a received long training subcarrier with a conventional 802.11a long training pattern to form a first product and multiplying the received long training subcarrier with an extended 802.11a long training pattern.

The Office Action has interpreted the operation of the transmit sample matrix S and the receive sample matrix R represented in figure 3 of Stuber as including the multiplication of a long training subcarrier with a conventional 802.11a long training pattern and with an extended 802.11a long training pattern. As described in paragraphs [0044] and [0045] of Stuber, these matrices are associated with multiple signals that are transmitted and received over a channel. Nothing in Stuber is understood to disclose or even suggest that any part of the received signals, represented in matrix R, is multiplied by both a conventional 802.11a long training pattern to

form a first product and by an extended 802.11a long training pattern to form a second product.

Therefore, independent claim 6 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 6 are respectfully requested.

Claim 7

Independent claim 7 concerns a method of transmitting signals using a plurality of transmit channels. The method includes allocating the data to be transmitted among the plurality of transmit channels, wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels. A modified preamble is transmitted from each of the plurality of transmit channels, wherein the modified preamble is distinguishable at a receiver from a conventional 802.11a preamble and includes an out-of-band component.

Stuber is not understood to disclose the foregoing features of the claim 7. In particular, Stuber is not understood to disclose at least the feature of a modified preamble that includes an out-of-band component.

The Office Action cites to paragraph [0057] of Stuber to support the contention that the preamble described in Stuber includes an out-of-band component. Applicants respectfully disagree with this interpretation of Stuber. This paragraph of Stuber states that “providing a space-time preamble structure reduces or eliminates signal non-linearities and spurious, out-of-band signal transmissions.” This portion of Stuber arguably teaches away from including an out-of-band component in the modified preamble since it seeks to reduce or eliminate out-of-band signal transmissions. Accordingly, Stuber is not understood to disclose this feature of claim 7.

Therefore, independent claim 7 is believed to be allowable over Stuber, and all other art

of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 7 are respectfully requested.

Claim 10

Independent claim 10 concerns a method of transmitting signals using a plurality of transmit channels. The method includes allocating the data to be transmitted among the plurality of transmit channels, wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels. For at least one set of at least two adjacent transmit channels, data is transmitted over the set wherein at least some data is encoded in out-of-band subcarriers at frequencies between frequencies allocated to the at least two adjacent transmit channels.

Stuber is not understood to disclose the foregoing features of claim 10. In particular, Stuber is not understood to disclose at least the feature of data being encoded in out-of-band subcarriers at frequencies between frequencies allocated to at least two adjacent transmit channels.

As discussed above with respect to claim 7, Stuber is understood to provide a space-time preamble structure that reduces or eliminates out-of-band signal transmissions. Contrary to the interpretation made in the Office Action, paragraph [0057] of Stuber is not understood to disclose or even suggest that data is encoded in out-of-band subcarriers.

Therefore, independent claim 10 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 10 are respectfully requested.

Claim 11

Independent claim 11 concerns a method of increasing data capacity in a communications system having a channel divided into a plurality of adjacent frequency bands separated by out-

of-band frequency ranges, where data is transmitted within the bands of the plurality of frequency bands. The method of increasing the data capacity of the channel includes allocating a first portion of the data to be transmitted from a transmitter among the plurality of transmit frequency bands and allocating a second portion of the data to at least one out-of-band frequency range when the first portion is allocated to adjacent bands, wherein the at least one out-of-band frequency range includes an out-of-band frequency range between the adjacent bands. The first portion is transmitted within the plurality of transmit frequency bands and the second portion is transmitted within the at least one out-of-band frequency range.

Stuber is not understood to disclose the foregoing features of claim 11. In particular, Stuber is not understood to disclose at least the feature of allocating a portion of data to be transmitted to an out-of-band frequency range between adjacent transmit frequency bands.

In paragraph [0027], Stuber refers to frequency ranges at which the described MIMO system may transmit and receive signals. The Office Action has contended that the indication in paragraph [0027] that the “unlicensed 5.8 GHz band” may be interpreted to correspond with the out-of-band frequency range recited in claim 11. Applicants again respectfully disagree with the interpretation made in the Office Action.

The “unlicensed 5.8 GHz band” mentioned in Stuber is not understood to refer to an out-of-band frequency range between adjacent transmit frequency bands. Rather, this frequency band in Stuber is understood to refer to one example of a transmit frequency band used by the system described in Stuber.

Therefore, independent claim 11 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 11 are respectfully requested.

Claim 13

Independent claim 13 concerns a method of discriminating between a packet sent as a conventional 802.11a packet and a packet sent using an extended mode not normally supported under the conventional 802.11a standard. The method includes receiving a signal from a wireless medium, wherein the signal was transmitted from an extended mode transmitter as a packet wherein packet data is preceded by a packet preamble and wherein the packet preamble is generated from a cyclically shifted 802.11a preamble. The signal is demodulated to obtain a demodulated signal and the demodulated signal is decoded to obtain a packet data sequence including a cyclically shifted 802.11a preamble when receiving packet data from an extended mode transmitter and a conventional 802.11a preamble when receiving packet data from a conventional 802.11a transmitter. Which type of packet was sent is discriminated based on the received packet data sequence.

Stuber is not understood to disclose the foregoing features of independent claim 13. In particular, Stuber is not understood to disclose or suggest at least the feature of a packet preamble generated from a cyclically shifted 802.11a preamble.

The Office Action references the cyclic prefix 57 depicted in the frame structure shown in figure 5 of Stuber as corresponding to a cyclically shifted 802.11a preamble. As described in paragraph [0050] of Stuber, the cyclic prefix 57 refers to a guard interval used to prevent inter-symbol interference between signal structures. Nothing in Stuber is understood to describe or suggest that the cyclic prefix 57 refers to cyclically shifting an 802.11a preamble to generate a packet preamble for transmission from an extended mode transmitter.

Therefore, independent claim 13 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 13 are respectfully requested.

Claim 20

Independent claim 20 concern a method of transmitting a packet, using a MIMO transmitter having a plurality of antennas, over a wireless network. The method includes obtaining data fields of a packet to be transmitted and generating preamble fields of the packet to be transmitted, including an extended mode preamble distinguishable at a receiver from a conventional 802.11a preamble, wherein a conventional 802.11a receiver can decode one or more fields of the extended mode preamble. The packet including the extended mode preamble is then transmitted.

Stuber is not understood to disclose the foregoing features of independent claim 20. In particular, Stuber is not understood to disclose or suggest at least the feature of an extended mode preamble that can be decoded by a conventional 802.11a receiver.

In paragraph [0008], Stuber indicates that standard 802.11a preamble structures are not directly applicable to MIMO communications systems and therefore require significant modifications for use in those systems. An example of a modified preamble structure is shown in figure 5 and described in paragraph [0050] of Stuber. As is evident from figure 5, the preamble structure differs from the standard 802.11a preamble structure. Nothing in Stuber is understood to disclose or suggest that this modified structure is decodable by a conventional 802.11a receiver.

Therefore, independent claim 20 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 20 are respectfully requested.

Claim 28

Independent claim 28 concerns a method of transmitting signals using a plurality of transmit channels. The method includes allocating the data to be transmitted among the plurality

of transmit channels, wherein at least one of the plurality of transmit channels transports some data that is not transmitted over all of the other of the plurality of transmit channels. A modified preamble is transmitted from each of the plurality of transmit channels, wherein the modified preamble is usable for performing channel estimation and at least a first part of the modified preamble for at least a first of the plurality of transmit channels is a cyclically shifted version of a second part of the modified preamble for at least a second of the plurality of transmit channels.

Stuber is not understood to disclose the foregoing features of independent claim 28. In particular, Stuber is not understood to disclose or suggest at least the feature of a modified preamble wherein at least a first part of the modified preamble for a first transmit channel is a cyclically shifted version of a second part of the modified preamble for a second transmit channel.

As discussed above with respect to claim 13, Stuber is not understood to disclose or suggest cyclically shifting a portion of a preamble to form a modified preamble. The cyclic prefix discussed in Stuber is understood to refer to a guard interval and not the cyclical shifting of a portion of a preamble. Accordingly, Stuber is not understood to disclose or suggest transmitting a modified preamble wherein at least a first part of the modified preamble for a first transmit channel is a cyclically shifted version of a second part of the modified preamble for a second transmit channel.

Therefore, independent claim 28 is believed to be allowable over Stuber, and all other art of record. Reconsideration and withdrawal of the § 102(e) rejection of claim 28 are respectfully requested.

Dependent Claims

The other claims rejected under § 102(e) as being anticipated by Stuber are dependent, either directly or indirectly, from the independent claims discussed above and therefore are

believed to be allowable over the Stuber, and all other art of record, for at least the same reasons.

Claim Rejections – 35 USC § 103

Claims 9 and 35

Claims 9 and 35 are rejected under 35 USC § 103(a) as allegedly being unpatentable over Stuber in view of U.S. Patent Application Publication No. 2002/0065047 (“Moose”).

Claims 9 and 35 depend from independent claims 7 and 28, respectively, discussed above. Moose is not understood to disclose or suggest anything to remedy the deficiencies of Stuber discussed above. Accordingly, claims 9 and 35 are believed to be patentably distinguishable over the applied references for at least the same reasons discussed above with respect to claims 7 and 28.

Claims 24-27

Claims 24-27 are rejected under 35 USC § 103(a) as being unpatentable over Stuber in view of U.S. Patent Application Publication No. 2004/0005018 (“Zhu”). Applicants have reviewed the applied references and respectfully submit that these claims are patentably distinguishable over the references for at least the following reasons.

Independent claim 24 concerns a method of communicating a packet, using a MIMO transmitter having a plurality of antennas, over a wireless medium to a MIMO receiver. The method includes obtaining data fields of a packet to be transmitted and generating preamble fields of the packet to be transmitted, including an extended mode preamble. The packet, including the extended mode preamble, is transmitted as a signal into the wireless medium and a representation of the signal is received from a wireless medium. At a receiver, the signal is demodulated to obtain a demodulated signal and a packet data sequence including data representing at least a portion of a preamble is decoded from the demodulated signal. Where

the receiver is a MIMO receiver, the packet data sequence is processed according to an extended mode operation, and where the receiver is a conventional 802.11a receiver, the packet data sequence is processed to determine at least one valid conventional 802.11a preamble field and deferring further data reception related to that packet data sequence after determining, from the preamble, that the packet data sequence represents a packet not in conformance with a conventional 802.11a packet.

The applied references are not understood to disclose or suggest the foregoing features of claim 24. In particular, the applied references are not understood to disclose or suggest at least the features of for a conventional 802.11a receiver, processing a packet data sequence to determine at least one valid conventional 802.11a preamble field and deferring further data reception related to that packet data sequence after determining, from the preamble, that the packet data sequence represents a packet not in conformance with a conventional 802.11a packet.

As conceded in the Office Action, Stuber is not understood to disclose the processing of a conventional 802.11a receiver as described in claim 24. To remedy the deficiencies of Stuber, the Office Action applied the teachings of Zhu. Applicants respectfully submit that even in combination with Zhu, the applied references are not understood to disclose the features of claim 24.

The Office Action cited paragraph [0053] and figure 1 of Zhu in its contention that Zhu describes the processing performed by a conventional 802.11 receiver described in claim 11. Paragraph [0053] simply describes that a receiver may be arranged to support various wireless LAN systems, including 802.11a and figure 1 of Zhu depicts a conventional 802.11a frame format. Even if Zhu were understood to disclose processing a packet data sequence to determine at least one valid conventional 802.11a preamble field, which Applicants do not concede,

nothing in Zhu is understood to disclose or suggest deferring further data reception related to that packet data sequence after determining, from the preamble, that the packet data sequence represents a packet not in conformance with a conventional 802.11a packet.

Therefore, independent claim 24 is believed to be patentably distinguishable over the applied references, and all other art of record. Reconsideration and withdrawal of the § 103(a) rejection of claim 24 are respectfully requested.

Claims 25-27 are dependent from independent claim 24 and therefore are believed to be allowable over the applied references, and all other art of record, for at least the same reasons.

CONCLUSION

Therefore, for at least the reasons presented above with respect to all of the pending claims subsequent to entry of this response, Applicants assert that all claims are patentably distinct from all of the art of record. All objections and rejections having been addressed, it is respectfully submitted that this application is in condition for allowance and a Notice to that effect is earnestly solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Charge Statement: For this application, the Commissioner is hereby authorized to charge any required fees or credit any overpayment to Deposit Account 17-0026.

Respectfully submitted,
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